

AN
Experimental History
OF
ROAD WATER^{1171. h. 9}
IN
WILTSHIRE,²

With a Short
Mechanical Account of its VIRTUES;
AND OF
CHRONICAL DISTEMPERS.

In a LETTER to the Rev^d Dr. *DERHAM*,
Canon of *Windsor*, F. R. S.

By *STEPHEN WILLIAMS*, M. B.

Ac 1500 per Ydoo

L O N D O N.

Printed for A. BETTESWORTH and C. HITCH, in
Pater-Noster-Row, and J. LEAKE at *Barth*.

MDCCLXXXI.

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Canon of Windsor, F. R. S.

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LONDON:

Printed for A. BATHURST, in Pall-mall.
1733.

Experimental History

ROAD Water.

In a LETTER to the Revd Dr. *Derham*
Canon of *Windſor*, F. R. S.

Reverend Sir,



YOU will forgive me in ad-
dressing myself to you in a
publick Manner, when 'tis
done with a Design to com-
municate ſome Experiments
to the World, in favour of a Mineral
Water lately diſcovered at the Village
of *Road* in *Wiltſhire*: Since you was an
Eye-

An Experimental History

Eye-witness of many of them, and thought them fit to be presented to the Royal Society, to which you have been so great an Ornament, I need not make any farther Apology.

While I practis'd Physick at the *Bath* for several Years, which Place, you know, must naturally lead the Physicians into the Study and Examination of Medicinal Waters; Fame attributed no common Virtues to a new Spring at *Road*; Curiosity in Natural History tempted me to the Place, and finding that no Gentleman of the Faculty had made any Experiments, I resolv'd to amuse away some leisure Hours about it; when, beyond my Expectation, several and often repeated Trials convinced me, that the *Road* Water did deserve no small Credit, and that it was richly impregnated with Iron, Sulphur and Salt.

We are naturally inclined to make the most curious Inquiries into the Qualities of Mineral Waters, because Nature herself has compounded their Ingredients in the most exquisite Manner, whose Method we may endeavour to imitate, but not equal. 'Tis true, that Art can incorporate simple Medicines in a very elegant and agreeable Manner,
but

of Road Water.

but the Virtues arising from such a Composition must often fall short of the Qualities which result from a Mixture of the same Ingredients compos'd by Nature, as is very evident in Medicinal Waters, whose chalybeate Particles are too Volatile to be confin'd in the most close, and even hermetically-seal'd Glasses; the nicest Tinctures of Steel, that Chymistry can contrive, wants this Property.

The Design of this Epistle being only to oblige the World with an Experimental History of Road Water, and a short Mechanical Account of its Operation upon Human Bodies, I shall not fill it up with a long Preface about the Nature and Use of Medicinal Springs in general: I must refer the Reader to various Authors, who have voluminously treated this Subject; They have upon good Grounds demonstrat'd, that since Water is the general Vehicle of all our Nourishment, what Effect it must have upon the Texture of the Blood, when it enters into it Simple and Pure, and what Impressions it gives to the Animal Oeconomy, when saturat'd with the Particles of Minerals.

Tho' the first Author, that I would recommend to the Reader's Perusal, is a

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Treatise of the best Father of Physick,
Hippocrates, Περὶ Ἀέρων ὑδάτων καὶ Τόπων, where the Nature and Qualities of Water is well accounted for, both from Theory and repeated Observations, he justly remarks the Diseases arising from bad Waters, as well as the Advantages resulting from good: His Observations and Remarks have stood the Test of our own learned Age, and been found true, and confessed as such by the modern Contemners of Antiquity.

'Tis true, the Reader will likewise be agreeably entertained with the Labours and Discoveries of our modern Philosophers, and our own Nation can boast of the best in that learned Body the Royal Society; they have taught us how to talk rationally upon Chymical Principles, and have solved the most surprising and difficult Phænomena with Mechanical and Mathematical Reasons; we are no longer at a loss to know why Bodies can be suspended in a Fluid specifically lighter than themselves, when their Particles are so far divided, that their Surfaces are extended to a sufficient Degree. But still all their Discoveries only demonstrate the Truth of what *Hippocrates* had observed, so far as they respect Mineral Waters. In this manner he, and all the Antients,
had

had experienced, that the lightest and simplest Waters were best for constant Use and Drink. The Light that Mechanical Principles afford us, must inform us, that if Metallick Principles do float in Plenty in any Water, they cannot fail to procure an Alteration in the Animal Oeconomy, either for a more uniform Motion of the Parts of the Human Machine if medicinally used; if otherwise, for putting a Stop to the Engine, by clogging some of its Springs.

The Idea *Hippocrates* had of hard and bad Waters creating Obstructions, I think to be beautiful, the very Words, ὕδατα σκληρά καὶ ἀπέχονα, seem to carry an Idea of Obstructions. Dr. *Lister* interprets the Words, *Aquas Indomabiles*, *Foesius Coctu Difficiles*, and we may translate Indigestible Waters; but I believe we cannot find any Word, either in the *Latin* or our own Language, that fully expresses the Meaning of the Greek ἀπέχονα.

When I had the Pleasure of entertaining so great a Philosopher and Friend as yourself at *Bath*, with a Repetition of many of the Experiments upon the Road Waters, and Remains after Evaporation, you may remember, Sir, I mention'd my vain Attempt to procure Specimens

Specimens of the Strata of Earths and Stones found in sinking the Pump, which is about forty Feet deep, because the Inside of it is walled up. So that the Reader must be contented with the best Account I could procure from the Owner; who tells me in a Letter,

“ That in sinking the Pump, the
 “ Workmen at first, for two or three
 “ Feet deep, found a black Earth; then
 “ they came to a stiff, yellowish Clay,
 “ which continued for eight or ten Feet
 “ farther; when they met with a hard
 “ Sort of Marly Clay of a dark blueish
 “ Colour, the Thickness was about ten
 “ Feet; below this appear'd a hard scaly
 “ Rock, about one Foot and half thick,
 “ thro' which issued a weeping Spring;
 “ the Owner apprehended this would be
 “ dry in Summer, like the Neighbour-
 “ ing Wells, and therefore resolved to
 “ descend farther, and for eighteen or
 “ twenty Feet deeper nothing shew'd it-
 “ self, but the same blue Marl, till the
 “ Workmen came to another Rock of
 “ the same Thickness and Nature, with
 “ the first, which, when work'd thro',
 “ let in a fine Spring, which is supposed
 “ to be our Mineral Water. This Ac-
 “ count is confirmed by the Workmen,
 “ who add, that within three or four
 “ Feet of the Bottom of the Well, they
 “ per-

of Road Water.

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“perceived such a sulphureous Smell,
“that they were almost suffocated.”

The Village of *Road*, seven Miles from the *Bath*, is seated towards the *South-West*, upon an easy Ascent above the River; the Water, of which we write, is in the Court of Mr. *Benjamin Edwards*, who one Day observing that a Piece of Flesh boiled in it was turned to a blackish Colour, immediately conjectured, that it was saturated with some Mineral, the known and common Experiment of Galls soon discovered the Truth of his Opinion.

The Colour of the Water is not to be distinguish'd from that of common Water; the Taste is very chalybeate and sulphureous; the last Quality is likewise discovered by its Odour or Smell.

Colour of
the Water.

The Weight of this Water is very little different from that of common Water, if we may believe the Hydrostatical Ballance.

Gravity.

Let us now hasten to the Experiments, which convinced me, that the *Road* Spring was strongly impregnated with Iron, Sulphur, and Salt, the last of an Alkaline Nature, and not to be distinguish'd from the *Natron* of the Antients.

The In-
gredients.

Our

Experi-
ments up-
on the Wa-
ter.

Our Method was this, we first poured into the Water at the Pump, Powder and Tinctures of Galls and other Astringents, to which we must add a great Variety of Acids and Alkalies, to see whether a Fermentation or Præcipation would follow.

Evapora-
tion.

2. We evaporated the Water *ad Siccatatem*.

Experi-
ments up-
on the Re-
mains.

3. Upon the Residuum or Remains after Evaporation, we dropt various Sorts of Liquors, Acids, Alkalies and Astringents.

4. We committed the Residuum to the Fire, to see whether it would confess any Sulphur or Salt by Smell, Liquefaction or Decrepitation.

Separation
of the Sul-
phur from
the Salt.

5. But that we might be more certain of the Nature of the Residuum, we infused it in River Water, that the Sulphur undissolv'd might remain at the Bottom of the Glass, and that the Salt being easily capable of a Solution, might float and be suspended in the Liquor. It may be necessary, for avoiding Confusion, to distinguish one by the Name of the Sulphureous or Second Remains, the last by the Title of the Saline Liquor.

6. Upon

of Road Water.

9

6. Upon the Sulphureous Remains we tried several Experiments with various Medicines and Fire.

Experiments upon the Sulphureous Remains.

7. Into the Saline Liquor we poured Acids, Alkalies and Astringents, we evaporated also a certain Quantity of it *ad Siccitatem*, when the Salt appear'd in Substance, which likewise went thro' a Course of Experiments.

Experiments upon the Salt.

At the Pump the Water would immediately charm the Eye with a beautiful purple Colour as soon as the Powder or Tincture of Galls was added; the same Phænomenon appeared with the Powder of *Cortex Granatorum*, *Flores Babauftiorum*, Oak Leaves, and Green Tea Leaves: Indeed, every Experiment commonly made to prove the Existence of Iron in Medicinal Fountains succeeded; and as they are common, and so well known by almost every Person, I shall not swell this Treatise with a needless Repetition of them. However, we must not forget this Water has one Property, tho' common to most of the chalybeate Class, that it would not strike a purple Colour at any Distance from the Well, even carried but seven Miles, as I found by several and often repeated Trials made the same Day at Bath. So

Iron one of the Ingredients.

C

volatile

volatile are the Ferrugineous Particles; and therefore we had no Hopes of finding any in the Remains, nor would the Application of the Loadstone or Tincture of Galls, afford the least Suspicion of any. 'Tis true indeed, that the Water being kept some time in a Bottle, lets fall a Sediment resembling *Crocus Martis*, but in a very small Quantity, which would afford a faint purple Colour with Tincture of Galls; so that it may be safely concluded, that the chalybeate Particles in the Road Water are for the chief Part volatile.

No Acidity in the Water.

I know not by what unlucky Fate it happens, that all Ferrugineous Springs are rank'd in the Class of Acidulæ or Acid vitriolate Kind; for if these Words are allowed to suppose an Idea of an Acid, which I think they do, it may perhaps be a Vulgar Error; at least our Road Water cannot be said to be tinged with any Acidity; for it will Lather with Soap, it produces no visible Operation upon Coral, it will not coagulate Milk, either cold, heated or boiled together; and as a convincing Proof that it is impregnated with no Acid, Syrup of Violets changes the Water to a Grass-green Colour.

It may not be a Crime to mention a Hint, after what manner and what effect Fire or Heat produces upon Mineral Waters. We before observed, that this Water at *Road*, when cold at the Mouth of the Pump, put on a beautiful Purple with Galls or Tea Leaves; yet being heated or boiled, and immediately poured upon Galls in Powder or Tincture, a purple, or even a blackish Colour was in vain expected; and thus the Family of Mr. *Edwards* constantly use this Water for Tea with Pleasure, without any disagreeable Taste. Perhaps it may be a useful Hint to some Gentlemen, how in some measure to rectify the Disadvantage of hard, stony Waters, when they have no other for Drinking near their House, for the Fire will make all the Mineral Particles to subside or evaporate, so that the Water, when cold again, may be fit to Drink, and useful to the Animal Oeconomy: probably it will not have so agreeable and pleasant a Taste, as hard petrifying Well Water in Summer, but more Healthy; for the terrestrial, indigestible Corpuscles cannot fail to obstruct, not only the small Capillaries, but likewise the most passable and largest Strainers, and produce many Irregularities in the Movements of the Human Machine; and such Wa-

ters may be in the strictest Sense called, ὕδατα σκληρὰ ἢ ἀτίεα; and here appears a very good Reason for the Truth of what *Cyprianus* had observed, that Malt Liquors are not so apt to produce the Stone as some other Drinks are; one of the concurrent Causes is this, the Water being heated to a Degree of boiling, before it is mixed with the Malt, all stony and gross Particles are precipitated to the Bottom of the Furnace, as the Brewers find by Experience, and the incrustated Sides and Bottom of the Ladies Tea-Kettles, furnish us with a parallel Instance. So that in some Cases Malt Drinks may have the Advantage of Crude Water, and some other Liquors; and that Crude Water is more or less impregnated with terrestrial Particles, the Water-Drinkers can assure us, who meet with as different and various Tastes in it, as other People do in several Sorts of Wine; but I shall digress no farther,

Having, I believe, proved the Existence of Iron, let us next consider the second Ingredient Sulphur.

Sulphur in
the Water.

Syrup of Violets changes the Water to a Grass-green Colour. This Dr. *Plot* asserts to be the Characteristick of a sulphureous Water; to which I must add,
'tis

'tis likewise the Index of a Lixivate Salt, and not an Acid Vitriol.

Spirit of Urine altered the Water to a faint reddish Colour, another Index of Sulphur; had the Water been Aluminous, Spirit of Urine would have turn'd it milky, as it does the *Holt* Well. We must not forget likewise, that Spirit of Urine produced no Fermentation, nor did *Spiritus Salis Ammoniaci*, or any Alkali, which they probably might have done if an Acid had abounded in the Water; but if any doubt, they may be satisfied, if they will draw a Conclusion from many future Experiments without my particular Observation.

Flesh boiled in this Water turns to a black Colour, had the Salt in it been of a Nitrous or Aluminous Nature, it would have appeared red.

Linen infused for some Days in the cold Water, will be as yellow as in the *Bath* Water.

The Pump Rod grows black, and is corroded thro' in a Year's Time; some may imagine from an Acid Vitriol, but this Objection is easily solved and conquered, if we reflect that Iron attracts Sulphur, tho' render'd brittle by it;
witness

witness *Chalybs cum Sulphure Mus.* where the Iron Bar is made almost as brittle as Glass for the length of an Inch: the Essayers of Metals throw Iron into the Crucible, to try whether the Oar abounds in Sulphur; which likewise makes brittle several other Metals, as the Labourers in Silver, Copper, and Tin daily experience, being obliged to use many Calcinations to destroy and evaporate the Sulphur, before they put the Oar into the Melting Furnace; and our Modern Projectors labour under almost insuperable Difficulties to make Iron as malleable, when melted with Sea-coal, as with Charcoal, or with Wood, the last being less pregnant with gross Sulphur. The Price of Tin melted with it in the Blowing-Houses, is much greater than when fluxed with Sea-coal in the reverberatory Furnaces in *Cornwall*. The same holds good in respect to Copper melted in *Germany* and *Sweden* with Wood: Again, how brittle do Zink render *Bath Metal*? The sulphureous Quality of Spelter or Zink every one knows.

But lest the Reader may not be so well satisfied of the Existence of Sulphur by these Trials, we will next entertain him with an Account of the Remains after Evaporation.

The

The Evaporation being performed, one Gallon of Water leaves about a Dram of the Residuum, which is of a yellow Colour, and a salt, pungent Taste.

Experiments upon the Remains.

During the Operation of Evaporation, a Film or Pellicle, imitating the Colours of the Rainbow, was observed to swim on the Surface of the Water, which being taken off, and gently dried, resembled *Flos Sulphuris* in Colour and Taste: Its Weight was about half a Dram; it contain'd Sulphur, but not in so large a Proportion as the Residuum or Remains, for I tried the same Experiments upon both, and with equal Exactness.

Syrup of Violets dropt upon the Remains, procured a green Colour.

Sulphur in the Remains.

Solution of Sublimate altered the Remains to a tawny yellow Orange Colour.

Spirit of Urine changed the Remains to a reddish Colour.

Solution of *Saccharum Saturni* increas'd the yellow Colour of the Remains.

The

The Remains, by the Help of a slight, gentle Heat, readily mixes and incorporates with Oil.

Powder'd Nitre and Remains, mixed and placed in a Crucible over a gentle Fire, procured a strong Detonation.

The Remains would produce a Fermentation with the Chymical Preparations of Steel, as it did a slight Ebullition with *Mynsick's* Tincture. But this Phenomenon will appear in a better and stronger Light, as likewise will the next Experiment, when we come to consider the Operations of Steel upon the second or sulphureous Remains, as separated from the Salt.

The Remains placed upon a red-hot Iron, began to fume, and emitted a sulphureous Smoke of a blue Colour, then liquefied; we added powdered Nitre, and a vehement Detonation ensued.

All Acids, as Spirit and Oil of Vitriol, Spirit of Salt, Spirit of Nitre and Vinegar, caused an Ebullition, and immediately a Fermentation with the Remains; even a Solution of blue Vitriol caused a visible Ebullition with the Remains.

mains. Spirit of *Sal Ammoniac*, and Alkalies produced no Effervescence.

And here it is natural to remark, how several Bodies acted in a sensible and visible manner upon the Remains, tho' they did not, nor were they capable of causing a sensible Operation upon the Water itself. The Doctrine of Attraction, advanced and so well demonstrated by the *Newtonian* Philosophy, furnishes us with a satisfactory Reason for this Appearance, as well as other chymical Phenomena. The Power of acting in all Bodies or Particles of Matter whatever, being greatest at the Point of Contact, and decreasing in a reciprocal Proportion to their Distance, which must be the Case of Bodies dispersed or dissolved in any Fluid or Menstruum; and for this Reason Acids, tho' they were incapable of affecting and operating upon the Mineral Particles floating in the *Road Water*, and of producing an Ebullition or Fermentation, yet they visibly acted upon the Remains, when a Fermentation happened.

These Experiments, sufficient to convince us of the Existence of Sulphur in the Remains, with what has been said about Acids, might likewise satisfy us of the Nature of the other Ingredient,

D

Salt,

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Salt, that it is of an Alkaline Quality; but at present we shall be silent on that Head, and reserve our Observations till we come to treat of it in a distinct manner.

The Sulphur separated from the Salt.

And that the Analysis of these Ingredients might appear in the best Light, and we have Liberty experimentally to examine the Properties of both by themselves, we infused zss. of the Remains in zvi. of cold River Water; it tasted very strong of a Lixivate Salt, and look'd a little yellow; after some Time, at the Bottom of the Glass subsided a yellow Powder, its Weight was about ziii.s. Permit me to distinguish it by the Name of the Sulphureous or Second Remains; and the impregnated Water by the Title of the Saline Liquor.

Experiments upon the Sulphureous Remains.

Let us first examine the Sulphureous or Second Remains; Syrup of Violets changed them to a green Colour.

Solution of Sublimate made the Remains appear of a higher yellow Colour at first, and after some Time, of a more brown Colour.

Spirit of Urine obliged the Remains to appear under a reddish Colour.

The

The sulphureous Remains easily incorporates, and by the Assistance of a slight Heat, dissolves in Oil of Almonds.

Solution of *Saccarum Saturni* increased the yellow Colour of the Remains.

All Acids produced an Ebullition and Fermentation in an intense Degree: Thus a Solution of Alum caused a slight Ebullition, Vinegar a strong one, Oil of Vitriol a vehement Fermentation, and Spirit of Salt a violent one, with a hissing Noise; its Sediment was of a blackish or dark Colour.

Alkalies occasioned no Effervescence nor Alteration, unless in the Colour, as is hinted in several of the Experiments.

Inflammability being always allowed the true constituent Character of Sulphur by the Chymists, we placed the second Remains upon a red-hot Iron; it emitted a blue Smoke, and soon flamed, with a strong sulphureous Smell; we added powder'd Nitre, which caused a violent Detonation, and made it burn all away.

'Tis the known Property of Iron to ferment with Sulphur. We dropt Mr.

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White's Oil of Steel (made of *Sal Armon.* & *Linat. Martis* *an. qu. v.* and after many Calcinations left to run *per Deliquium*) and immediately a very strong Ebullition and Fermentation followed, the Mixture puffed up to a prodigious Degree, and almost fill'd the Glass with a hissing Noise, and in the same manner continued without subsiding for several Hours, of a brown yellow Colour. The same Phenomenon appeared with *Tinctura Martis Myrsicis*, & *Rad. Martis*, tho' not in so exalted a Degree.

These Mixtures having undergone the Operation of Fermentation, and each of them having put on the Form of a dark yellow, frothy Substance, we resolved to try what Fire would extort from them; accordingly we placed each of them separately upon a red-hot Iron Bar. The Phenomenon was first a Smoke of a blue Colour, with a sulphureous Smell, then Liquefaction, and soon after every Mixture burn'd till almost consumed. The same Appearance happen'd when the Mixtures were thrown into an open strong Fire.

But that we might be as exact as possible, we put the red-hot Iron and Mixtures

Mixtures in such a Position, that the Fume or Smoke fell on the Flame of a Candle, when the most beautiful blue Colour appear'd on its Edge, and reach'd from the Flame in one direct Line to the Iron; and this we distinctly and separately observed with each of the burning Mixtures.

We placed Copper as well as Silver upon the Mixtures while burning; the Smoke changed the first to a white Colour, the last to a yellow. Silver and Copper also suffered a Change of Colour when strongly rubb'd with the second Remains.

We mixed an equal Quantity of the sulphureous Remains and *Limar. Martis*, well cleansed and depurated by a Loadstone, and after a gentle Trituration, we made them into a Paste with Water; after some Time we dropt a little more, and a visible, tho' small, Ebullition followed, some Bubbles rising to the Sides of the Glass; after the Expiration of two Days we put the Mixture upon a red-hot Iron, and it emitted a sulphureous Smoke: Powdered Nitre caused a Detonation and a Flame.

These Experiments, I flatter myself, will have Weight enough to convince any

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any reasonable Person of the Existence of Sulphur in our *Road Fountain*, tho' it cannot be asserted, that it is so volatile as the other Ingredient Iron, the one soon flying away, the other a more firm Adherent to the Alkaline Salt; which now offers itself to our Consideration.

Salt.

Experiments upon the Remains.

We before observed that the first Remains had a salt, pungent Taste.

That the Remains exposed to Air run *per Deliquium*.

That Acids caused a Fermentation with the Remains, tho' Alkalies none.

That Syrup of Violets changed the Remains to a Grass-green Colour.

That a Solution of Sublimate turned the Remains to a dark yellow, or orange Colour.

Experiments upon the Saline Liquor.

We are next to examine the Saline Liquor, as we called it for Distinction-sake, which we evaporated to the Consumption of half the Quantity, and then we dropt into it several Medicines.

Syrup of Violets communicated a very green Colour to the Saline Liquor.

New

New Milk suffered no Alteration, tho' it was mixed with it for ten Hours.

Spiritus Cornu Cervi changed the Colour to somewhat yellow, without any Fermentation; the Mixture emitted a strong, penetrating Smell, and a little fetid.

Solution of Silver in Spirit of Nitre, mixed with the Saline Liquor, immediately appeared a Coagulation of Particles of a white Colour, which soon subsided at the Bottom, in the Form of a white Powder.

Spirit of Nitre caused an Ebullition, and immediately a Fermentation, which continued for some Time; at the Bottom were precipitated some few Grains of Salt: Oil of Vitriol likewise precipitated some Particles of Salt.

When we had evaporated the Saline Liquor *ad Siccitatem*, the Salt in Substance offered itself to our View.

The Salt is of a dark greyish Colour, and of a pungent Lixivate Taste.

The Quantity of Salt was about $\frac{3}{16}$ of the Remains, making some small

small Allowance for other heterogeneous Particles.

I could not observe that this Salt put on any regular Figure, or had any Tendency to shoot into Crystals; the Texture of the Body or Substance of the Salt seem'd to be porous and perforated like a Sponge, as we found by the Help of Glasses.

This Salt exposed to Air, soon dissolved, and run *per Deliquium*; even while we examined it upon the Glass, that the Salt seem'd to float in a Globule of Water.

We put some Grains of the Salt upon a red-hot Iron, but neither a Decrepitation, Liquefaction, or Smoke followed.

Syrup of Violets dropt upon the Salt communicated a green Colour.

The Salt dropt into a Solution of Silver in Spirit of Nitre, precipitated a white Powder.

Spirit of Salt poured upon the Salt, caused a violent Fermentation: Oil of Vitriol shew'd the same Phænomenon.

Spirit of Nitre likewise violently fermented with the *Road* Salt, the Colour of the Spirit grew more yellow, and after Twenty-four Hours the Salt at the Bottom of the Glass appeared more white.

Vinegar dropt upon the Salt procured an Ebullition and Effervescence, and even a Solution of blue Vitriol caused an Ebullition; but to be more nice, we powdered an equal Quantity of blue Vitriol and the *Road* Salt together, then we instill'd some Drops of common Water, and a more sensible Ebullition soon appeared.

Solution of Sublimate changed the Salts to a tawny orange Colour; this Phenomenon Mr. Boyle, Dr. Plot, and Du Clos have laid down to be the most certain Characteristick of any Salt being a fixed Alkali or Lixivate Salt.

Alkalies produced no Fermentation or Ebullition with the Salt in Substance.

Spirit of Urine altered the Colour of the Salt to a yellowish, inclining to red; had it been Aluminous, the Colour would have been white.

Salt of Tartar powder'd and well rubb'd with the *Road* Salt, produced a fetid, penetrating Smell; a parallel Instance Dr. Leigh found by mixing Salt of Tartar and the modern *Egyptian Natron*, and relies much upon this Experiment,

Spirit of *Sal Ammon*, mixed with the *Road* Salt, emitted a strong, penetrating Smell, as it does with Quick-lime; the Colour of the Salt was a brown yellow: The same Odour arose with *Spiritus Cornu Cervi*.

These, Sir, were the Experiments which persuaded me, that our Salt did not differ from the modern *Natron*, or *Nitre* of the Antients: It has all the Properties of an Alkaline and Lixivate Salt; and unless this Salt may be dignified with the Title of *Natron*, I know not in what Class to range it.

While it floats in the *Road* Water there is no Acidity, because several Experiments evince a contrary Quality; and Syrup of Violets produces a green Colour.

While the *Road* Salt is one of the Ingredients in the first Remains, it gives a pungent Taste to the Tongue,
and

and exposed to Air, dissolves *per Deliquium*.

While it saturates the Saline Liquor, we find a strong, pungent, lixivial Taste; Acids cause a Fermentation and a Precipitation.

When it offers itself in Substance to our Senses, its pungent, lixivate Taste bites the Tongue; it runs *per Deliquium* in open Air in a short Space of Time, and ferments with Acids, and its Texture appears to be spongy and porous.

Many more Experiments might be repeated to our Purpose, which, I doubt not, the Reader must remember; however, we must not forget that the Road Salt cannot be said to be Aluminous, because Spirit of Urine changes the Water at the Pump, the first Remains, and the Salt itself, to a reddish Colour; had an Alum dwell'd in this Fountain, the Colours would have been white.

It cannot be called Nitrous, such, I mean, as the modern Salt Petre, because Flesh boil'd in the Pump Water is turn'd to a black Colour; it makes no Detonation in the Fire, and like Salt-Petre it does not tend to crystallize; to which we may add, that the modern Nitre

will not dissolve in the Air, nor ferment with Acids, nor has any Lixivate Taste.

The perforated and porous Texture of the Salt, seems to distinguish it from *Sal Armoniack*, which is more firm and closer knit together.

I flatter myself, the Properties we have mention'd and experimentally discover'd in the *Road Salt*, will answer the Description of the *Ægyptian Nitre*, as any Person will be satisfied, that will consult the Natural Historians.

The Characteristick that *Pliny* gives of the *Ægyptian Nitre* is, *Ut sit tenuissimum & quam maximè spongiosum, fistulosumque*; and then mentions its Property of dissolving in the Air, *Ægyptium in vastis picatis affertur, ne lique scat*; and then adds, *Adulteratur in Ægypto, deprehenditur gustu, sincerum enim facile resolvitur, adulteratum pungit, calce aspersum reddit odorem vehementem*: And as to the Colour, *Pliny* says, *In Ægypto sunt Nitrariæ egregiæ, in quibus rufum exit a colore Terræ*; and our late Inquirers find, that the modern *Natron* brought from *Ægypt*, besides its porous Texture and Property of dissolving in Air, is endued with a blusky red Colour; but being dissolved in Water

ter and filtred, a red, clammy Matter stuck to the Filtre, and the Solution looked clear. *Hippocrates* distinguishes Nitre by the Name of *Nitron* *ἰγυρεόν*.

To confirm another Quality which the Moderns observe in *Natron*, its fermenting with Acids; the Sacred Writings mention Nitre and Vinegar as a Similitude of the Incongruity of one thing with another: The Translators of the *Hebrew* finding a more friendly Agreement between Vinegar and our modern Salt-Petre, were not a little puzzled, and some were almost persuaded to alter the Text.

The Nature of the Nitre of the Antients will likewise appear from the Virtues, which they ascribed and found by Experience to belong to it. The Holy Scripture also affords us no small Light into this Affair, by mentioning Nitre as a thing very absterfive and fit to cleanse the Skin, which is the known Property of fix'd Alkalies. *Hippocrates* prescribed Nitre in detergent and stimulating Pessaries. *Galen* orders it in *Smegmatis ad Achoras & Asperitates Cutis*. *Ætius* recommends the famous *Albulæ*, which by their nitrous Salt were found to cleanse Ulcers, and that they were drank inwardly to cleanse and to purge. And thus

thus Nitre was likewise added to the artificial Baths of the Antients. This plainly confirms the Conjecture of the Etymologists, who derive the Word Nitre *ἔν νιτρειν* τὸ νίξεν ἢ τὸ νίπλεν, to wash and cleanse. Pliny is very full and particular in delivering the Vertues of Nitre, he says, *Nitrum in Medicinâ calfacit, extenuat, mordet, spiffat, fccat, & exulcerat; utile his, quæ sunt evocanda aut discutienda, & lenius mordenda & extenuenda, sicut in Papulis & Pusulis; ulcera oculorum apud Nitrarias celerrimè sanantur. Scabrities Genarum, Prurigines, Lepras, Vitilignes Albas emendat. Phagedænis & Ulceribus, quæ serpunt aut putrescunt, resistit; Hydropicis cum Fico tusum datur & illinitur; infanditur Ventrîs & Renum doloribus, aut rigori Corporum vel Nervorum doloribus; Paralysi in Linguâ imponitur; in Anginâ datur; morbum Regium in vino potum exterminat.* You see, in Pliny's own Words, what Properties he allows in Nitre: Its stimulating Quality was not unknown to Celsus, who orders it in his *Emplastra Epispastica.*

These Properties, which the Fathers of Physick had experienced in Nitre, must be confessed to be the Effects of a Lixivate Salt, which every one knows is a powerful Detergent, Attenuant, and Diuretick;

retick; and since so many of the learned Antients, tho' of different Nations, universally concurred in the Description of the Vertues of Nitre, which properly belong to the *Ægyptian*, it may be safely concluded, that the Nitre of *Ægypt* was chiefly known, and only used in Medicine in the *East*: And in respect to Mechanicks, it may not be improper to remark, that *Pliny* mentions the Method of making Glass with Nitre as an Ingredient, which must be the *Ægyptian*, since it answers so well the Description of the modern *Kali*.

I know some Chymists of great Note and Learning fiercely contend, that all Lixivate Alkalies are the Productions of Fire, as *Helmont* and his Followers: Dr. *Lister* with Assurance asserts, that there is not any natural Alkali in Medicinal Waters, against whom Dr. *Leigh*, with good Reasoning, urges Experience and Matter of Fact, and solemnly declares, that he extracted out of *Burnly* Waters in *Lancashire* by Evaporation, a Salt not to be distinguish'd from the *Natron* of the Antients, either in Quality or Effect upon human Bodies. Dr. *Sympton* asserts, that he extracted an Alkalizate Salt out of *Buxton* Wells in *Derbyshire*. *Du Clos*, supported by good Experiments, is of Opinion, that
most

most of the Mineral Waters in *France* are impregnated with this Sort of Nitre, and that all their Cures are owing to it. Mr. *Boyle*, in Opposition to *Helmont's* Notion, endeavouring to demonstrate, that Fire is not always a necessary Agent in the Production of a Lixivate Alkali, brings *Natron* for his Proof, which had all the Properties of an Alkalizate Salt: And how should it appear a Wonder, that natural Alkaline Salts are found in Medicinal Fountains, since nothing more evidently demonstrates the Beauty of the Operations of Nature, even acting under the Appearance of second Causes? Thus a Lixivate Salt is often used as an Ingredient in the Composition of Mineral Waters, that the gross Body of Steel and Sulphur might be opened and dissolved, that a better Tincture might be extracted, and the Water be more richly impregnated with the most subtle and finest Parts: We endeavoured the same Intention by mixing fix'd Salts in our Tinctures and Infusions. However, if what some of the Antient Writers assert is true, that this Nitre was also dug out of Quarries and Mines, the Question is out of Dispute.

No one can object, that the Alkaline Quality of our Salt owes its Birth to Fire, since the same Property appeared
in

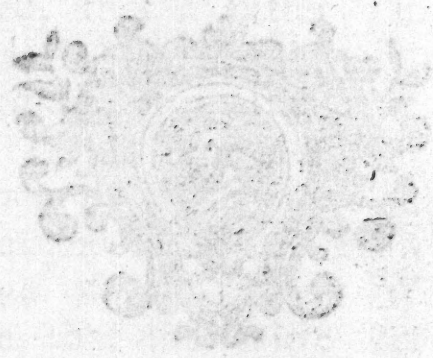
in the Water before we used the Help of Fire; besides, our Chymists demand a greater Degree of Heat for the Production of lixivate Salts, as is evident in *Nitrum Fixetum*, and all chymical Products of that Kind.

The Ingredients in the *Road* Water, being proved to be Steel, Sulphur, and *Natron*, it may probably be agreeable to improve our Discoveries by just and natural Consequences, and give a short mechanical Account of this natural Physick, and of chronical Distempers, and, in particular, such as have been relieved at *Road*.



In the Water before we add the Iron
of the Road, our Chemicals demand
a great degree of Heat for the Pro-
duction of Nitric Acid, as is evident
in the Water before, and all chemical
Products of that kind.

The Ingredients in the Road Water
being mixed to the Acid, Sulphur, and
Nitrogen, it may probably be necessary
to improve our Distillation by first and
natural Condensation, and give a strong
Account of this natural
Process, and of chemical Distillation,
and in particular, that as have been
related to Road.





A SHORT

Mechanical Account

Of the VIRTUES of

ROAD *Waters,*

AND OF

Chronical Distempers.



UTHORS in general seem to agree, that Chronical Diseases owe their Birth to Obstructions.

The Idea of an Obstruction supposes the Blood and animal Juices circulating with a very small Degree of Motion, or stagnating in the Vessels.

The Vessels, unless from some external Injury, cannot be hurt but from a **Fault of the Fluids they carry.**

The Fault of the Blood and Juices must be either in Quantity or Quality.

Plethora.

A Plethora, or too great a Quantity of Blood, must suppose a proportionable Quantity of *Succus Nervosus* secreted, and flowing to the Heart, since all Secretions are in a reciprocal Proportion to the Quantity of Fluids arriving at the Orifice of the Glands, the Heart receiving an unusual Share of animal Spirits, will contract oftner and more violently, and communicate a stronger Impulse to the Blood, which will circulate with greater Velocity, and be divided into smaller Parts, so as to become more fluid: The Arteries will be distended beyond their natural Dimensions, the Pulse will be quicker and stronger, and an Inflammation or some acute Distemper succeed, which critically terminates in a usual and given Space of Time.

Acute Distempers.

If an acute Distemper don't appear, a continued Distention of the Vessels will cause a Relaxation of their contractile

tractile Fibres; the Velocity of the Blood will gradually diminish, and its Cohesion or Viscidity proportionably increase; too small a Quantity of animal Spirits will be generated for muscular Motion; the Humours will stagnate and settle, with a preternatural Distention upon the weakest Parts; or else a Rupture of the Vessels, with an Extravasation of the animal Juices, will follow.

A Diminution or Inanition of the Blood, *i. e.* the Fault of the Blood in too small a Quantity, is seldom the primary Cause of Diseases, unless from some external Accident, and therefore we shall not enlarge upon it; whenever it happens, it is chiefly in a secondary manner, and symptomatical to another Disorder of the animal Oeconomy, tho' most difficult to be relieved.

The Fault of the Blood, as to Viscidity and Fluidity, has in one way been accounted for under the State of a Plethora; and it will likewise be done in another manner, by considering the Blood as render'd acrimonious; tho' this last Quality may sometimes be said to owe its Birth also to a Plethora or Redundancy of Humours, and at other times to vicious Particles and pungent Salts,

The Fault of the Blood as to the Quality.

Salts, which find a Passage into the Mass of Blood, under the Form of Meat and Drink; and now and then, perhaps, thro' some of the most open Secretions: Such Particles cannot fail of corrupting the animal Juices, and changing the Nature of the compounding Parts; on the other hand, we cannot suppose, but that redundant Humours, when they stagnate, must corrupt and grow acrimonious.

Now if we consider the Blood in an acrimonious State, we must suppose its Texture so altered, that the sanguineous Particles have put on, and formed themselves into such Shapes, as by their Points they can stimulate, lacerate, and even corrode thro' the tender Fibres of the Solids; besides the constituent Particles of the Blood will be so disunited and disjoined, that its Mixture will be quite altered; and from the various Cohesions of its Globules must arise different Degrees of Fluidity and Viscidity, for the compounding Particles of the Blood, which before did with equal Force press each other, will have different and irregular Attractions; that some of them will firmly cohere together, and form Corpuscles too large for the natural Diameter of the Vessels, while others will be dissolved and rendered

dered too fluid, and so take up a greater Space than usual, and distend likewise the Canals of the human Machine,

Again, these acrimonious and pungent Particles of the Blood, will act like so many Stimuli, by irritating and stimulating the sensible Fibres, and cause a greater Derivation of Humours upon the affected Part; and sometimes even wholly contract the Orifices of the Capillary Tubes; by this means the Glands will be obstructed, and the Secretions stopt, or, at best, rendered very irregular; so that we may in some Cases allow a Relaxation of the largest and more passable Canals, with a Contraction or Astringency of the Capillary Pipes.

This Method of Reasoning hath a long while satisfied me, why Salivation by Unction hath so often proved effectual, when the other way, by internal Medicines, hath not answered: I take the Case to be this, The Particles of Calomel, being armed with sharp Points, stimulate the sensible Fibres of the minutest Ducts even to Contraction, and by shutting up their Orifices, are refused Admittance; while crude Mercury, in the *Unguentum Neapolitanum*, gains a free

A Mechanical Account of the
 free Passage and Entrance to the Seat
 of the Distemper.

The determinate Shape and Form of vitiated Humours and acrimonious Spiculæ of the Juices, 'tis not easy to demonstrate, and probably the most curious Inquiries will never satisfy us. 'Tis sufficient to our Purpose, that they are furnished with such Points and Angles as are capable of making suitable Impressions upon the Membranes; and that they really act under such Angles, Experience and acute Pains daily convince our Patients.

To explain this Theory, and apply it to solve all the Phenomena and Symptoms attending every Disease, Constitution, and Climate, would be to write a whole System of Physick; however, we shall only observe, that many Liquors of very different Natures are regularly, by the Laws of the animal Oeconomy, secreted from the same fluid, sanguineous Mass, and that the compounding Particles of each of these Liquors, as well as the Blood itself, can admit as many Alterations, as they are capable of receiving different Degrees and Directions of Motion, and they cannot be altered in their Nature as to Viscidity, Fluidity, or Acrimony,

mony, without effecting the animal Oeconomy after the manner explained.

From hence we safely pronounce the Nature of chronical Distempers to consist in a Relaxation or Weakness of the Solids, the Blood being too viscid to pass thro' all the Stages of Circulation, and too tenacious to be comminuted and dissolved by the tonick Action of the Vessels, and often by Stagnation it grows acrimonious enough to corrode even their tender Threads.

Chronical
Diseases.

The Doctrine of Obstructions being made easy and plain, we may observe, that as they settle upon different Parts, they will create as many Disorders, which will have as various Appellations and Names; thus if Obstructions fall upon the Nerves, or the Vessels which go to feed them, or are complicated with them, the Motion of animal Spirits through the nervous System will be interrupted, the Celerity of the Blood will flag with an augmented Viscidity, and a universal Relaxation of the Elastick Fibres of the Vessels; hence all the Train of Hysterical, Hypochondriacal, and Nervous Maladies.

Nervous
Distempers.

If Obstructions fall upon the Blood-Vessels or Lymphaticks, they will not

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be

be able to contract themselves, and counter-balance the Re-action of the glutinous and viscid Juices, that they will more and more be distended by a constant Afflux of Humours, which will, perhaps, at last stagnate and corrupt, and even break the Texture of the Vessels themselves; and thus may be accounted for, the Origin and Appearance of Dropsies, Diabetes, Tumours, Rheumatisms and scorbutick Disorders, as well Ulcers, Cancers, and all chronical Diseases.

The Seat
of chroni-
cal Dis-
eases.

We generally find the Seat of chronical Diseases to be in the smallest Capillaries and Glands, where the Juices move with a small Degree of Velocity, and their compounding Particles have sufficient Time to attract one another, and their Surfaces run into the largest Contact, and at last shoot into large Corpuscles of a solid Consistence, which by stagnating gradually turn Acrid. And here appears the Difficulty of curing and relieving chronical Maladies; and the Time required before Medicines can reach the peccant Humours, which are by slow Degrees convey'd, and almost riveted into the most distant Fibres and Glands themselves, and there often lie dormant for no small Space of Time; and after this manner Poison may be
con-

conveyed into the most secret Recesses of the human Machine, and there remain unactive, at least, without any visible Operation, for a long while, if we can but bridle, or, physically speaking, so sheath or blunt the Edges of the poisonous Spicula, that they do not exert their Force upon the largest or more passable Canals, but gently slide into the minutest Pipes.

The Intention of curing and relieving
chronical Diseases, both from Theory
and Experience appears to be, to dis-
solve and break the præternatural Cohe-
sion of viscid Particles, and correct the
Acrimony of the coagulated Humours;
to remove Obstructions from their Set-
tlement in the Capillaries and Glands;
to open the Secretions, and quicken the
retarded Circulation, by recovering the
elastick Tone of the largest, as well as
smallest, Vessels.

Method of
curing
chronical
Diseases.

A flight Reflexion upon the Laws of
the animal Oeconomy will teach us,
that before we pretend to Repair the
Tone of the Solids, how often 'tis ab-
solutely necessary to empty the Vessels,
or make a Revulsion, in order to re-
move Obstructions which arise from a
Plethora, or a viscid State of the Blood;
'tis then we are to apply such Means,
G 2 when

Evacuati-
ons.

Corrobo-
rants.

when the Resistance of the Fluids is subtracted, that will wind up the relaxed Fibres, and make the Canals adapt their Capacities proportionable to the Quantity of Liquids they carry: And every Person conversant in Practice must observe, that astringent Medicines, used without proper Evacuations first made, often settle and irreparably rivet the obstructing Humours upon the weak affected Part, or some of the Viscera.

Deobstru-
ents.

The Tonick Motion of the Canals being restored, they will contract with more Vehemence, and play upon the sanguineous Mass with smarter Vibrations, and propel a due Quantity of Juices to the secretory Organs and Vessels designed for Nutrition; but it is of equal Concern to call in the Assistance, and often first to administer such Medicines, as are dignified with the Name of Deobstruents and Alteratives, which by their specifick Gravity and attenuating Quality will comminute the most firm Cohesion of glutinous and incrasated Juices, and even penetrate the minutest Pipes; by this means Obstructions will be dislodged and propelled into the common Road of Circulation; the peccant Salts and noxious Spiculæ, will, by a gentle Attrition, be broken,

broken, and rendered incapable of Action; and, at last, the Morbifick Corpufcles will be expelled the human Fabrick by the proper and natural Strainers; then will the animal Juices, being fufficiently subtilized, move with Freedom in their proper Tubes, which will likewise have Liberty to exert their natural contractile Force and Strength.

And again, we may make another very useful Remark in Practice, how often we are obliged to use Evacuations before we prescribe Deobstruents and Alteratives; the Effect of the last is not only to attenuate and dissolve the Lentor of fizy Humours, but they will increase the Velocity of the Blood likewise, as appears by the Pulse; and consequently such Vessels, as are already loaded and distended with a viscid Plethora, will receive a greater Quantity and Accumulation of Fluids, and their Coats will be more and more distended, and a Tumor or a Rupture will succeed. And thus appears the Skill and Judgment of a true and good Physician; when and how to advise Methods seemingly Contradictory, as Evacuants, Deobstruents, and Corroborants or Astringents; but conducive to the Health of our Patients, if discretely used,

used; and in a proper Time: Tho' the Faculty have no greater Opportunity of shewing their Knowledge in Physick, than in complicated Cases, where two Diseases attacking the Patient at the same Time, with as irregular Symptoms and Variety of Complaints, require as different Methods of Treatment, and almost at first Sight contradictory and repugnant to one another; to which we may add, the great Variety of Constitutions.

Let us next take a View of the Virtues of the Ingredients in the *Road Waters*, and how they appear to be the proper Instruments of bringing Ease and Relief to People labouring under the Severity of inveterate and chronical Maladies.

The Vir-
tue of
Iron.

The Virtue of Iron is to communicate a gentle Titillation, and brace up relaxed Fibres; and at the same Time, by the Gravity and Pressure of its Particles, to penetrate the smallest Tubes, and attenuate viscous Obstructions; and thus Iron is deservedly dignified with the Title of a good Deobstruent: We formerly observed, how subtile and volatile the chalybeate Particles of *Road Water* appeared to be, and consequently how penetrating.

The

The Sulphur will gently deterge the Inside of the Canals of vitiated Humours; it will involve and sheath their pointed Spiculæ, it will gain a Passage into the minutest contracted Pipes; and seems, by its healing Quality, design'd as a Balsam to the human Machine.

The Virtue of Sulphur.

The Lixivate Salt will agreeably cleanse the Stomach and Viscera: When it has passed the Lacteals, and insinuates itself into the sanguineous Composition, it will mildly stimulate the Solids, and powerfully dissolve the Union of peccant Matter, and discharge it from the animal System by opening the Secretions by Urine, and sometimes by a slight Purging: The Virtues, which the Antients ascribed to their Nitre, and Experience suggested to them, have been mentioned before; and we doubt not, but that our Road Salt will answer and equal it in the detergent, attenuating, and diuretick Quality, as it did in other Properties.

The Virtue of the Salt.

These must be allowed to be the Virtues of the Ingredients, considered in a separate View; what their united Force must be, combined together, 'tis not difficult to conceive; What may we not expect from a Composition, where

where Steel, Sulphur, and an Alkaline Salt jointly co-operate and conspire to human Health? We ought likewise to reflect, how great a Diluter common Water is experienced to be, and we need not fear any Danger of the *Road* Water relaxing the Solids too much, since 'tis so richly impregnated with such strengthning and corroborating Particles: And upon so good a Foundation we may safely pronounce, that the *Road* Water answers the Intention of the best Alterative.

The Effect
of *Road*
Water, as
experien-
ced by the
Drinkers.

We shall be agreeably pleased, if we reflect upon the constant Effect which the Sick find upon drinking the *Road* Waters: They sit pleasant and agreeable upon the Stomach, and remarkably create an Appetite, and help Digestion; they, at first using, give one or two gentle Motions a Day, but afterwards chiefly pass off by Urine: At the same Time we find our Method of Reasoning supported and confirmed by Experience, while several chronical Distempers insensibly disappear and vanish, which we shall mention, and in a slight manner consider.

Disorders
of the Sto-
mach.

When the *Road* Water descends into the Stomach, its constituent Particles will pleasantly stimulate and corroborate the

the weak relaxed Fibres; the peccant Humours will be dissolved and washed away into the Intestines; the Organ of Digestion, being freed from its Load, will be able to exert its natural contractile Force; the Attrition and Digestion of the Aliments will be performed in a just Measure; the Chyle will be prepared fit to assimilate with the Mass of Blood, and to nourish the Body: Hence Loss of Appetite, Nauseas, Vomiting, Cardialgia's, and several Disorders, will be conquered and vanish. And since 'tis almost become a physical Proverb, *Such as the Chyle is, such is the Blood*, the good or bad State of the *Primæ viæ* will accordingly prepare the Chyle for Nutrition or Secretion; and therefore, by rectifying them, we not only often destroy the Seeds of acute, but prevent a Return of chronical Distempers, at least defend the *Primæ viæ* from being attacked or possessed by the old inveterate Matter wandering and floating in the Stream of Circulation; and in this manner the gouty Humour, by the Laws of the animal Machine, will laudably fix and settle upon the Joints and Extremities, and broken Constitutions will be repaired.

H In

Disorders
of the In-
testines.

In the Intestines our *Road Water* will produce the same Effect, as upon the Stomach; by winding up the relaxed Fibres of the Coats of the Intestines, the peristaltick Motion will be continued with a sufficient Momentum; the Fæces will be dissolved and protruded to the Rectum for Expulsion; the pancreatick and bilious Juices will be regularly secreted for meliorating the Chyle to be absorbed by the Lacteals; and thus Diarrhœa's, Lienteries, and even Costiveness itself, will be relieved as well as prevented, since the Excrements will be diluted, and dissolved, and discharged by the proper Emunctory; which when fluid and first corrupted, cause Diarrhœa's and Colicks; and if hardened by lying too long in the Intestines, procure as opposite an Appearance as Costiveness, and often an Iliack Passion; so that this Water may be said to relieve two opposite Disorders in their proper Turn. We commonly find, that most Mineral Waters, upon their first Use, relax and open the Body, witness the *Holt*, *Bristol*, and *Bath Water*, as well as this of *Road*, which constantly, at first, promote one, two, or three Motions a Day. And it is owing to this: The corrupted Humours in the Stomach and Bowels being dissolved

solved by the Water, and washed away with it, stimulate the Intestines, till by a gentle Purging they make their Exit at the Anus; and then the Load of Impurities being taken away, the Fibres of the Viscera will recover the usual Degree of Tensility, and the Waters in greater Quantity enter the Lacteals, and chiefly pass off by Urine: And here appears the Necessity of preparing the Body by proper Evacuations from the *Primæ viæ* themselves, lest the Mineral Waters, being too strongly impregnated with the peccant Matter, wash and carry some of its Particles into the Mass of Blood.

When the *Road Water* has passed the Lacteals, and gains Admittance into the ordinary Current of Circulation; if 'tis drank in large Draughts and Quantities, it will only affect the widest and least complicated Canals, and soon work off, by augmenting the urinary Secretion; fabulous Obstructions and calculous Concretions, which choak the urinary Passages, will be disunited and propelled into the Bladder.

Obstructions in the urinary Ducts.

But if this Water is drank in small Draughts, and at convenient Distance of Time, and thereby suffered to diffuse itself not only thro' the most passable

The Effect of the Water, both in the large and small Vessels upon the Juices.

fable and widest Canals, but to soak and insinuate itself very far into the Habit of Body, it will dilute and dissolve the intimate Cohesion of peccant Salts and Humours; the Ingredients Steel, Sulphur and Salt, will act with an Impulse equal to their Gravity, and penetrate the minutest Passages in proportion to the Fineness and Subtily of their compounding Particles; Obstructions in the smallest Pipes, Fibres and Nervous Meanders will be comminuted and propelled into the common Current of Circulation; the Asperities of acrimonious Matter will be smoothed and abraded off; the natural Elasticity of the relaxed Threads will be recovered and preserved, as well as the Diameter of the finest contracted Tubes will be opened and enlarged; and upon this Foundation our modern Theorists have demonstrated, that whatever will remove Obstructions, will, in one Sense, both astringe relaxed Vessels, and relax contracted ones, that is, restore them to their natural Dimensions.

The Blood and Juices being subtilized and rendered fluxile to a sufficient Degree, a greater and due Supply of Spirits will be secreted for muscular Motion, the Heart will contract with Freedom, and communicate a stronger Impulse

Impulse to the Blood, and the Arteries will vibrate with smarter Oscillations upon it, the Secretions will be in proportion to its Velocity, and the Impurities of the Humours will be evacuated in an equal Degree and regular Manner, and that of Urine increased in proportion to the superabundant Plenty of Water that is drank, and an Equilibrium between the Action of the Solids, and Reaction or Resistance of the Fluida be restored.

Scorbutick Salts will suffer the Fate of being broken by a gentle Attrition; the fizy Humours, which stretch the Capillaries in the Muscles and Extremities, and create tormenting Pain, and a numerous Train of Symptoms, will be dissolved and reabsorbed into the common Stream of Circulation, till they are arrived at the proper Emunctory for Expulsion; and thus the most inveterate scorbutick Eruptions and Ulcers will disappear.

What has been said in relation to the Scurvy, may be applied, with little or no Alteration, to its Cousin-German, and often Co-operator, an old and inveterate Rheumatism; their Nature only differing in a greater or lesser Quantity of saline, pungent Particles, floating

floating in the Mass of Blood, and different Degrees of Viscidity, which equally excite short and painful Sensations.

Cutaneous Disorders.

The same Method of Reasoning will hold good in respect to the Itch and cutaneous Affections, even an Elephantiasis and Leprous Eruptions: We have no Occasion to repeat the Opinion of Authors about the Origin and Nature of these Maladies, we shall only observe, that as they are thrown off from the Mass of Blood, by rectifying its Crasis, we destroy their Seeds or Origin, at least help Nature in making an easier Discharge by the cutaneous Pores, or by dispatching the Salts by the urinary Passages.

Scrophulous Diseases.

If to the known Quality in the *Road* Fountain of relieving scorbutick and cutaneous inveterate Eruptions, we join the experienced Virtue of easing scrophulous Cases, and strumous Swellings of the Glands, we shall add no small Credit to the *Road* Water. Authors, and the most Learned, who have made the best Use of anatomical Knowledge, seem to settle the Seat of scrophulous Diseases in the small Vessels, which are most complicated, and farthest distant from the Fountain of Motion, the Heart,

as

as well as in the Glands in the various Parts of the Body, tho' it often becomes most visible to us in a strumous Swelling of the Glands of the Throat. We before hinted, that Humours enjoy an interrupted Freedom to attract one another, and suffer a Change in their Texture, or put on new Forms and Shapes in a reciprocal Proportion to the slow Degree of their progressive Motion. For this Reason scrophulous Juices fix their Seat in the minuteft and most complicated Canals, and lie dormant so long; tho', when they appear, 'tis in such an exalted Degree, that the poor Patients have never been deliver'd from such troublesome Guests all their Lives; the corrosive Spiculæ being sufficiently armed to commit the greatest Depredation upon the human Machine, and bid Defiance to the Approach of Medicines by the uncertain Meanders, and intricate Labyrinths leading to their glandulous Cells; and indeed what Liquids or solid Particles do find a Passage, seldom fail of being infected.

However, that the apparent Difficulty of getting Relief, may not throw the unhappy Sick into Despair, I shall mention one Case out of several more, which

which is, that of Mr. Orchard of Bath, whose Glands of his Throat often ulcerated and were healed up by the Help of Medicine, tho' only in a palliative manner, the Disorder appeared again in a short space of Time; but by taking the Water at Road internally, and washing the Ulcers externally with it, the Ulcers healed up; nor has any Return of the strumous Swelling attacked him, which is about one Year and half, as he informed me very lately by Letter. I have not been so particular in the Description of Mr. Orchard's Disorder as I should have been, had he not lived so near the Fountain Head, and desirous of making his Case known for the Benefit of Mankind. Several other Instances, in my own Practice, might be brought to illustrate the Efficacy of Road Water in scorbutick and scrophulous, and other Diseases, which are particularly mentioned; and, indeed, the Faculty have been so kind as to supply me with a Collection of Cases relieved by our Road Water, which, I think, there is no Occasion at present to publish; if I find the World desirous of them, it shall be done by way of Appendix.

Let

Let us reflect upon the corroborating and sweetning Quality of Road Water, and we cannot but expect great Ease and Help in the Interval of the gouty Paroxysms, by bracing up the weaken'd, relaxed Fibres of the Organ of Digestion and arterial Tubes, which convey Juices for nourishing the human Fabrick. Daily Experience convinces us of the Power of Steel and Sulphur in both regular, as well as anamolous Gouts; upon which Authors have treated so very largely, that there is little room for any Addition of mine. Tho', I flatter myself, it will not be impertinent to make an Observation upon the Simples commonly used in bitter medicated Wines, contrived to strengthen the Stomach, and protrude the arthritick Matter to its proper Seat, the Joints and Extremities. The *Cortex Peruvianus* is deservedly allowed an excellent bitter Corroborant in many Cases; but when it enters the Mass of Blood, and is conveyed in that Vehicle to the Extremities and least passable Pipes, it acts as the greatest Astringent upon the Tubes designed for Perspiration, that the distended Vessels continue for a long while swelled with accumulated

I

gouty

gouty Matter, till the Part at last seems affected with an anasaruous Swelling. Experience hinted this to me in several Instances, but more sensibly in one at Bath, where two Physicians of great Note were joined in Consultation; the Patient laboured under the Gout in the Stomach, which, by proper means, we made to retire to the Extremities, when a bitter Wine, where the chief Ingredient was the *Cortex Peruvianus*, was prescribed on the defensive Side of the Stomach; the Leg and Foot soon became and continued tumefied, after the manner of an anasaruous Swelling; the Skin seemed parched and dry, without the least Moistness; it pitted with the smallest Impression of the Finger: Reason suggested to me the immoderate Astringency of the *Cortex Peruvianus* upon the Capillary Vessels of the Skin, by a common Case in curing Heeticks; accordingly we omitted it in our Prescriptions, and immediately the perspirable Matter moistened the Flannel; and, by a laudable and gentle Discharge, the Leg and Foot recovered soon its pristine and natural Shape. This way of Thinking has often satisfied me, in some measure, of the frequent Appearance of the Gout in

in the two most western Counties of *England*, where the chief Liquor has been a slight *French* Wine, Cyder and Punch: The astringent Quality of these Liquors upon the Capillary Vessels appears at first View, and confirm'd by Experience; indeed the Tartar of the *French* Wine is not so easily dissolved or digested by the Heat of the Body and Action of the Solids; as likewise the immoderate diuretick Property of Cyder and Punch, by draining off the thinnest Humours from the Mass of Blood, may not contribute a little, but not wholly to this tormenting Malady. And to support our Argument, the Use of Port-Wine, and a mild, palatable Ale or Water, for some Years, has preserved People free from the Gout, formerly much afflicted with it, provided their Diet hath been moderate and regular.

Anatomists generally assert, that the ^{jaundice.} progressive Motion of the Blood in the Liver, and its Vessels is very slow; and thus the Cause of a Jaundice, as well as the Difficulty of relieving it sometimes, is readily accounted for; however, the prevailing Efficacy of the Ingredients in the *Road Water* will be able to remove

Obstructions in the Biliary Ducts, unless the most inveterate. Every Person, who has learned any thing from his own or other People's Experience, must know, how great a Deobstruent Steel is allowed to be, and with what Success administered in Obstructions of most Kinds, and even advised in a Schirrhus of the Spleen and Liver; the Virtue of *Natron* in this Disorder, the Antients fully experienced, as we formerly remarked from *Pliny*; I need not repeat the Qualities of Sulphur.

*Obstructio
Mensium.*

The Blood-Vessels, which Nature in a very particular manner contrived and designed for the periodical Eruption of the *Menses*, will not be able to resist such Deobstruents as these Ingredients, which will communicate a strong Impulse to the Blood, sufficient to rebound the Sides of the distractile Tubes, and will be followed with an Effusion of a proper

Fluor Albus.

Liquid: And as they so eminently correct and invigorate the Crasis of the Blood, we may expect good Success in a *Fluor Albus*.

Impurities
after acute
Distempers.

Acute Distempers often terminating in an imperfect and irregular Crisis, are

are apt to leave no small Quantity of Impurities to the animal System; or, at best, the sanguineous Mass is in a depauperated, weak Condition, and the Spring of the Solids in a shattered State. Now it must be granted, that the whole *Materia Medica* don't afford so efficacious and powerful a Composition to repair the elastick Tone of the Fibres and Tubes, and raise the Blood exhausted with Diseases, as well as cleanse it of impure Remains after Fevers of all Kinds, and other acute Distempers, as likewise to prevent a Return. The Bark itself generally requires the Assistance of Steel to forbid another Visit of intermittent Paroxysms, and has often the Help of Rhubarb, as every Physician must experience in intermittent Disorders of late Years, which have appeared under new and variety of Types, and critically terminated in an unusual Secretion, either by Stool or Urine, and not so often by the usual Discharge thro' the cutaneous Pores, which obliged rational Physicians to use different Methods of Cure and Evacuations: Purgatives, till of late Years were condemned by the general Voice of Mankind in Agues. And as Diseases alter in their Appearance,
so

so new Methods and Modes are upon very just Reasons introduced into Physick; and therefore how inconsistent must be the Notions of the methodical Sect among the Antients, and such Moderns as implicitly tread in their Steps?

An uncommon
intermittent
Fever.

I believe I shall not tire the Reader's Patience, if I relate the Case of a Gentleman of Reputation and Figure, Mr. *Archer* of St. *Ewe* in *Cornwall*, who was seiz'd with an intermittent Fever, which at first appeared under the Type of a Quotidian, and attacked him only at the Changes of the Year, and soon yielded to *Flores Chamæmeli* & *Sal Absinthii*; but after frequent Bleeding and Purging with *Lockyer's* Pills, by wrong Advice, his Blood became so weak, that it ended in a Quartan, which tho' it would at first yield to the Cortex with Steel and warm Stomachicks; yet the Interval rarely exceeded two Months. After some time resisting all medicinal Attempts, and despising all Laws, but those of the Moon, it kept Time with its Phases, and by constant Returns so debilitated Nature, that an entire Stop was put to the Motion of the human Machine.

chine. It is observable, that tho' this Gentleman was attacked with several Paroxysms between Full and New Moon, yet they were not so severe, nor the Rigor of so long a Duration, as those, which appeared the other Part of the Moon's Circuit; his Death happened just before Full Moon. The Ornament to his Country and Profession, Dr. *Kestell*, judiciously remarks, that what seemed most surprizing, while he attended him some times, was, that the Paroxysm always began with a painful Spasm between the first and second Vertebrae of the Neck; that he was Comatose for Twenty-four Hours, and sometimes for two Days or more, and Delirious much longer; the Crisis was not always by the Glands of the Skin, but sometimes by Urine, sometimes by an Oedematous Swelling in his Thighs and Legs, and now and then, by the Salival Glands; which last seemed to be the most perfect. I must leave this History, faithfully related, to the Consideration of our modern, ingenious Theorists. I shall only observe, that I know no Instance which more elegantly and fully confirms the Sentiments of the truly Learned Dr. *Mead*, in his Treatise *De Imperio Solis & Luna*,

Lana, as well as illustrate the different Methods, by which Nature brings on and perfects the Crisis of Diseases.

Impure
Remains
after Salivation.

What has been said in relation to purifying and invigorating the Mass of Blood after acute Distempers, may be applied with great Propriety to others of a more virulent Nature, to banish the corrupt Remains after Salivations, and other severe Methods of physical Discipline; People who have undergone a laudable Ptyalism or Spitting, find a universal Relaxation of the Solids throughout the animal System, as the too early Approach of Hecticks and Dropsies demonstrate; the Particles floating in the *Road Water* cannot fail of bracing up the Fibres of the Canals, and cleanse off mercurial Remains.

If we reflect with a little Seriousness upon the Virtues of Steel, Sulphur, and Salt, several other Distempers will occur to our Memory, where these Ingredients, either in a separated or united View, will be proper; which the design'd Brevity of this Treatise will not permit me to enlarge upon; but I leave this Subject to be im-

improved by other Physicians, who will not be at a Loss to know in what Cases, and at what Time, this Water at Road may be drank with good Success; and after what manner the Body must be prepared; about which I give no Rules or Directions; nor at this Distance is it easy to be done; I must refer the Patients to their own Physicians, who being best acquainted with their Constitution, will be the best Judges, whether Evacu-
tions are required, and by what Me-
dicines or Methods promoted, either from the *Primæ* or Animal Juices them-
selves; for we are often obliged to use different Degrees of Evacuations of different Sorts, and various Medi-
cines, as there are Multiplicity of Dis-
tempers, and Variety of Constitutions; thus of what Concern a perfect Know-
ledge of the last must be, appears at first Sight. The Learned Gentlemen of the Faculty being present, will also easily perceive when Alteratives and Deobstruents are indicated, to which this Water will be an excellent Ve-
hicle; and how often 'tis absolutely necessary to conquer one Symptom before we can attack another in Dis-
tempers, where several approved Me-
dicines are reckoned specifically good,

no Person, but what feels the Pulse, knows what it indicates. The great Criterion in Physick, is to know the Time, when and how a Medicine is to be given; thus we cannot at all Times and Seasons administer the Bark, Steel, and Opium, though the only Medicines, which, in the long Run, will procure Health to our Patients. This Argument alone ought to be a sufficient Inducement for Patients to rely upon the Judgment of their Physician when and after what manner Mineral Waters are to be used. I am fully convinced, that the Fall and Disreputation of most Medicinal Springs have been solely owing to an indiscreet Method of Drinking and Bathing without due Preparation or Advice: How often have too many precipitated themselves into incurable Disorders at *Bath* by such Ways? When Nature seemed to have composed the Medicinal Waters of that City, as a Specifick in the same Case; and daily Instances confirm the Truth of this Remark.

And here I cannot but congratulate that City upon its happy Situation, that it is not only blessed with the best Medicinal Fountains of their Kind in *Europe*, but that it has so many

many Mineral Waters round it, which may be successfully used during the Interval of the *Bath* Seasons, as well as often necessary in alternate manner. The Waters at *Bristol*, *Holt*, and *Road*, with that of *Bath*, seem to conspire to human Health, since each of them, in their Turn, relieve particular Disorders and Symptoms, and consequently cure both simple and complicated Diseases. Besides, no Patient can be at a Loss for Advice and Assistance, since *Bath* is situated so near our *Road* Fountain, where so many Physicians reside, who daily do an Honour to their Profession by their Practice.

The Quantity which is usually drank, is from one Pint to a Pint and half in a Morning, and one Glass in the Afternoon; tho', if the Sick would have the Patience to drink less of Mineral Waters at a Time, and continue their Use much longer, they would not so often be disappointed of their Hopes, it being plain from Mechanical Reasons and Matter of Fact, that the smaller the Quantity and Draught of Medicinal Waters is drank at a Time, the farther they penetrate into the Habit of

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Body,

Body, and remotest Stages of Action: Indeed, if we design to promote a large and visible Secretion immediately, the Draught ought to be proportionably great. Upon these Principles, and a good Knowledge of the Laws which Nature has impressed upon the Motions and Movements of the Human Machine, several ingenious Physicians have worked very great Cures, by exhibiting Mercurial Medicines in small Doses, which have pervaded the smallest Branches of the Vessels, and thereby become the best Alteratives; while the same Medicines, if exhibited in large Doses, have only affected the most passable and largest Tubes, and worked off in a short Space of Time. And by the same way of Thinking, we can make several Medicines (reputed and confessed Emeticks) to perform the Office of Catharticks, Diureticks, and Diaphoreticks, and even Deobstruents.

Having now given a short Rationale of Chronical Distempers, and, in particular, such as the *Road Waters* have by Experience relieved; some curious Gentlemen may perhaps expect, that I should treat of their Use in respect to Bathing and external Application; but

but as they have been only tried with relation to the detergent and healing Quality in washing scrophulous and scorbutick Ulcers, indeed with good Success; which Virtue likewise the Antients experienced in their Nitre; and have not as yet been used by way of Cold Bathing; I shall leave this Subject to be improved by People of better Judgment, and such as have more Opportunities, who do not want Instruction, what Notion the Antients had of Steel, Sulphur, and their Nitre, which the Moderns have confirmed and accounted for upon mechanical Principles.

If I may add any thing more, it must be, To recommend to the Patients a punctual Perseverance in the Method of Medicines, Diet, and Exercises prescribed by their Physicians: What Mischief an Error in Diet creates, too many unfortunately know by their own Experience: It will not be a Crime to mention this Observation, that while I attended, for some Years, *St. Bartholomew's Hospital in London*, we often saw several inveterate, chronic Maladies cured, which the late Learned and Ingenious Physicians of that House of truly-applied Charity,
Dr.

Dr. Levet and Dr. Wagstaffe, often complain'd, they could not conquer in Patients of better Condition, even when the Symptoms were not so severe or cruel. I must leave the Reader to draw the Conclusion; and I am certain, every Physician, who has any time been conversant in Practice, must often experience the Truth of this Remark,

Thus, Sir, I have given a faithful History of the Experiments upon the *Road Water*, which chalked out the Way to a perfect Knowledge of its Contents: An unexpected Removal to *Plymouth* prevented me from being more curious, where I am obliged to rely upon my Notes, which I at first drew up for my own private Amusement and Satisfaction; nor would they ever have appeared in Print, had not the Approbation and Request of several Physicians and Virtuoso's, to which Class you have been so great an Honour, prevailed upon me. Indeed I must add another very great Inducement; I mean, the Success and Cures which the *Road Water* have done this last Summer: And that I might satisfy such as are unhappily seated too far distant from the Faculty of Physick,
and

Virtues of Road Waters, &c.

and others, who are too inquisitively curious about their own Case in physical Treatises, I thought it might not be amiss to improve the Discovery of the Contents of *Road Water*, by a mechanical Way of Reasoning, and just and natural Consequences, and thereby shew the Virtues of this Natural Physick, as well as give a short Account, and communicate an Idea of such Diseases as have been relieved by it.

The Candor and generous Temper with which you receive all Lovers of Natural and Experimental Philosophy, must render your Friendship valuable and esteemed: 'Tis a sufficient Happiness to me, to be reckoned into the Number of your Friends.

If these Experiments I have related, please the Virtuoso's and Curious in Natural History or Chymistry, as they did yourself; or afford any useful Hints or Light into the Nature of Mineral Waters in general; or this of *Road* in particular; that thereby it becomes better known, and relieves the Sick, labouring under the Tyranny of inveterate Disorders, my Wish will be accomplished;

A Mechanical Account, &c.

plished; thinking that I have agree-
ably entertained some, and done Ser-
vice to the other Part of my Fellow
Creatures. Believe me to be,

Reverend Sir,

Your most obliged Friend,

And humble Servant,

March 6.

1744

Ste. Williams

F I N I S

